

DEVELOP 2023 Spring Preview





DEVELOP 2023 SPRING PORTFOLIO



New York City Transportation & Infrastructure

Community Concern: Urban heat is unevenly distributed in cities, often impacting already socially and economically vulnerable populations due to the lasting legacies of redlining and other land use practices. This pattern can be coupled with thermal (dis)comfort depending on wait times and types of above-ground public transportation shelters and structures.

Partners:

Transportation Alternatives

Earth Observations:

Landsat 8 TIRS
 Landsat 9 TIRS-2
 ISS ECOSTRESS

Impact: A geospatial analysis focusing on the intersections of urban heat, sociodemographic and – economic, and public health vulnerabilities will be incorporated into a spatial equity dashboard and inform cooling interventions, community engagement strategies, and advocacy for funding allocations.





Community Concern: The Great Salt Lake reached record low water levels in July 2022 and has shrunk by two-thirds due to water diversions and drought. Toxic dust from the increasingly exposed lakebed threatens to exacerbate already dangerous air quality on the Wasatch Front, especially in communities of color and low socioeconomic status living in closest proximity on Salt Lake City's Westside.

Partners:

- Utah Dept. of Natural Resources
- Utah Dept. Of Environmental Quality
- Great Salt Lake Institute
- Dust^2
- Great Salt Lake Coalition
- Utah Physicians for Healthy Environment
- Northwest Band of the Shoshone Nation
- Westside Coalition

Impact: Dust and air quality vulnerability maps will communicate the impacts of a

drying Great Salt Lake to legislators and residents, as well as inform mitigation strategies in an environmental justice framework.



<= 1985 vs 2022

Earth Observations:

- Terra & Aqua MODIS
- Sentinel-5P TROPOMI
- CALIPSO CALIOP
 - Suomi NPP VIIRS



Great Salt Lake Health & Air Quality

Community Concern: The Great Salt Lake reached record low water levels in July 2022 and has shrunk by two-thirds due to water diversions and drought. Toxic dust from the increasingly exposed lakebed threatens to exacerbate already dangerous air quality on the Wasatch Front, especially in communities of color and low socioeconomic status living on SLC's Westside.

Partners:

- Utah Dept. of Natural Resources
- Utah Dept. Of Environmental Quality
- Great Salt Lake Institute
- Dust^2
- Great Salt Lake Coalition
- Utah Physicians for Healthy Environment
- Northwest Band of the Shoshone Nation
- Westside Coalition

Impact: Dust and air quality vulnerability maps will communicate the impacts of a drying Great Salt Lake to legislators and residents, as well as inform mitigation strategies in an environmental justice framework.



Earth Observations:

- Terra & Aqua MODIS
- Sentinel-5P TROPOMI
- CALIPSO CALIOP
- Suomi NPP VIIRS





Colorado Springs Health & Air Quality

Community Concern: Colorado Springs is known for its majestic beauty, yet it is grappling with air pollution, which has been exacerbated by wildfires. City managers are interested in the application of Earth observations to help support enhanced air quality monitoring aimed to improve the city's air quality regulations and management practices in support of the Clean Air Act.

Partner:

City of Colorado Springs

Earth Observations:

- Terra MODIS
- Aqua MODIS
- Suomi NPP VIIRS
- CALIPSO CALIOP
- Sentinel-5 TROPOMI
- Aura OMI



Image Credit: Joe Dudeck (L) Nicholas Vassios (R), Unsplash

Impact: The project will create replicable methodologies for monitoring air quality using satellites and explore their integration with *in situ* measurements throughout the region to support air quality management and disaster resilience.



Los Angeles Urban Development

Community Concern: Rising temperatures in Los Angeles is forcing community leaders to find ways to combat the heat. Utilizing NASA Earth Observations, we can evaluate the impact of tree coverage on urban heat mitigation.

Partners:

- City Plants
- City of Los Angeles, Department of Public Works, Office of City Forest Management
- City of Los Angeles, Sanitation & Environment
- California State University, Los Angeles

Earth Observations:

- ISS ECOSTRESS
- Landsat 8 TIRS
- Landsat 9 TIRS-2

- Planet PlanetScope
- HyTES (Hyperspectral Thermal Emission
 - Spectrometer)



Image Credit: NASA

Impact: Our project deliverables will help our end-user partners identify appropriate locations to plant trees and evaluate the impact of their tree planting programs.



InVEST Urban Development

Community Concern: Increasing precipitation events and changing climate has driven the need to assess urban flood risk and vulnerability. The InVEST model, commonly used in DEVELOP projects, is a convenient tool to examine urban flooding. As there are limitations in the model, this project will develop improved techniques.

Earth Observations: • Sentinel-2 MSI

- GPM IMERG
- Sentinel-2 MS
 Capella SAR



Impact: Utilizing the InVEST Urban Flood Risk Mitigation Model, this tech & innovation project will generate rainfall runoff and runoff retention maps for test locations in the U.S. Enhancing and testing the functionality of the model can provide insight for many future DEVELOP projects that continue to rely on the InVEST model for flood risk and vulnerability assessments. A tutorial and detailed documentation with the refined methodology and tool will assist future teams as they work to address end user needs amongst various organizations experiencing urban flooding.



Marin County Wildland Fires



Image credit: Patrick Perkins, Unsplash

Community Concern: Marin County, like much of California, has experienced an increase in wildfire severity and frequency. Our partners at Fire Foundry need a better understanding of fuel load and land cover maps to make informed decisions for fire suppression and prevention.

Partners:

- University of California Berkeley, Disaster Lab
- Marin County Fire Department

Earth Observations:

- Landsat 8 OLI
 PlanetScope
 - Landsat 9 OLI-2
 - SRTM 4
 ECOSTRESS
 - Sentinel-2 MSI I
- Suomi NPP VIIRS

Impact: The partner's work would benefit from the inclusion of remote sensing to identify ideal locations to stop ongoing fires. This additional knowledge can impact their approach to fire suppression in real-time and build their capacity to use NASA Earth observations for their decision-making processes



Front Range Wildland Fires

Community Concern: Partners are heavily invested in ensuring Colorado has resilient forests to support functioning ecosystems, promote social benefits to these forests and mitigate against climate change, wildland fires, disease and other disturbances. They do not have a method to determine if forestry treatments that have been completed across the state meet intended management objectives.



Partners:

- Colorado Forest Restoration Institute
- Colorado State Forest Service

Earth Observations:

- Sentinel-2 MSI
- NAIP
- Landsat 7 ETM+
- Landsat 8 OLI
- Landsat 9 OLI-2

Impact: The team will support the partners by comprehensively evaluating and applying different earth observation products and associated classifications to map forest canopy cover to support forestry treatment monitoring across Colorado.



Georgia Disasters II

Community Concern: After 2017 Hurricane Irma, the state of Georgia received federal funding to aid in natural disaster recovery. Often, heirs property owners did not qualify for assistance due to fractured or tangled titles.

Partners:

Georgia Heirs Property Law Center

Earth Observations:

- Landsat 8 OLI
- Sentinel-2 MSI
- Sentinel-1 C-SAR



Impact: The team will refine flood extent maps and overlay computer assisted mass appraisal and socioeconomic data for 15 Georgia counties to determine Hurricane Irma's impact on potential heirs property owners. These end products will assist the Georgia Heirs Property Law Center's Disaster Mitigation Planning efforts by suggesting areas of outreach and presenting a case study to visualize the importance of their work.



WET Water Resources

Community Concern: In Spring 2019 and Spring 2020 the Great Lakes Water Resources DEVELOP projects created the Wetland Extent Tool (WET) and WET 2.0. This project will create WET 3.0 enhancing capabilities and updating WET to Google Earth Engine (GEE) Python API to Map Wetland Extent and Inundation in the Great Lakes Basin

Potential Users:

- US Fish and Wildlife Service, National Wetlands Inventory
- Minnesota Department of Natural Resources
- US Environmental Protection Agency, Office
 of Research and Development

Earth Observations:

- Landsat 8 OLI
- Sentinel-1 C-SAR
- Sentinel-2 MSI
- SRTM



Image Credit: NASA

Impact: Upgrading WET from GEE JavaScript API to GEE Python API will allow users to access the tool with greater ease in the future and support NASA's Open Science initiatives. Additionally, the team will generalize wetland identification so that it can be applied to other wetland areas.

Shoshone River Water Resources II

Community Concern: The downstream release of accumulated sediments at the Willwood Dam in Wyoming greatly reduces the water quality of the Shoshone River. This leads to ongoing deterioration of riparian and aquatic habitats, that of which the local community and fishing industry rely on.

Partners:

- Wyoming Department of Environmental Quality
- Shoshone River Partners
- USGS, Wyoming-Montana Water Science Center

Earth Observations:

- Landsat 9 OLI-2
- Landsat 8 OLI
- Suomi NPP VIIRS
- Aqua MODIS

- Terra MODIS
- GPMIMERG
- PlanetScope
- Sentinel-2 MSI



Impact: This second-term project will generate a snow cover time series analysis and Soil & Water Assessment Tool (SWAT) model analysis while continuing the first term sediment plume analysis using high-resolution imagery. The examination of snowfall and cover trends in relation to sediment accumulation will help our partners pinpoint where to best target their current management and restoration practices.

Maldives Climate II



Earth Observations

- Landsat 5 TM
- Landsat 7 ETM+
- Landsat 8 OLI
- Landsat 9 OLI-2
- Sentinel-2 MSI
- PlanetScope

Image Credits: NASA

Community Concern: about 80% of the country's land area is less than 1 meter above sea level. Understanding the potential impacts of sea level rise is essential to the republic's coastal infrastructure adaptation plans.

Partners:

- Maldives Ministry of Environment, Climate Change and Technology
- U.S. Department of State Bureau of South and Central Asian Affairs, Office of Bangladesh, Nepal, Sri Lanka, Maldives, and Bhutan
- **USAID** Maldives Office

Impact: This project will use various climate scenarios to help determine which coastal areas are most vulnerable to sea level rise over the next 17 years. The Ministry of Environment, Climate Change and Technology is responsible for several programs and services throughout the Maldives to encourage climate change adaptation and mitigation procedures and policies.



Northeast Alaska Climate

Community Concern: In recent decades, variability in snow cover has altered the ability of the northeastern Alaskan landscape to support resident and migratory wildlife in the Arctic National Wildlife Refuge (ANWR). Shifting patterns of snow depth affect the movement of caribou in the region and the food security of the communities that depend on these herds as a subsistence food source.

Partners:

- USFWS Arctic National Wildlife Refuge
- Alaska Climate Adaptation Science Center

Earth Observations:

- AMSR-E/AMSR-2
- Landsat 9 OLI/TIRS

ICESat-2

- Terra/Aqua MODIS
- Landsat 4–5 TM
- Landsat 7 ETM+
- Landsat 8 OLI/TIRS



Impact: Refuge managers may utilize snow variability maps and timeseries analyses that record changes in snow conditions from 1999–2023 to proactively prepare for the ecological, cultural, and landscape impacts that snow variability causes in ANWR.



Peru & Bolivia Climate



Image Credit: Greg Keelen, Unsplash

Community Concern: Irrevocable carbon reserves contain large stores of carbon that are at risk of being released due to human activity. Managing irrevocable carbon reserves could prevent the release of billions of metric tons of carbon into the atmosphere.

Partners:

Conservation International

Earth Observations:

- SMAP
- Landsat 8 OLI
- Landsat 9 OLI-2

Impact: This project will explore the use of NASA Earth observation data to monitor soil organic carbon (SOC) stocks over time in Peru and Bolivia, which will assist the partner with their initiative of co-managing irrevocable carbon sites in South America with local communities, including Indigenous groups and local governments.



Alabama Climate II

Community Concern: Decision-makers are facing a global demand to address greenhouse gas mitigation, specifically in relation to carbon emissions. The Southeast has historically shown above average levels of carbon output across the United States.

Earth Observations: Partners:

- Landsat 8 OLI Alabama Forestry Commission
- Landsat 7 ETM+ Alabama Chapter of the Wildlife Society
- Landsat 5 TM
- ISS GEDI
- ICESat-2 ATLAS



Image credit: Aaron Perkins, Unsplash

Impact: This project will build on the first project by expanding the study area to the entire state of Alabama and creating forest cover validation points using Collect Earth Online. The end products will help partners analyze carbon emission output across the Southeast in the past two decades with the hope of identifying forest management areas.



Idaho Ecological Conservation

Community Concern: Vegetation community successional stage heterogeneity is a significant issue affecting wildlife habitat condition and public access in ecosystems of Southeastern Idaho. To achieve a landscape mosaic of varying vegetation structures, land managers have implemented an experimental high intensity, short duration cattle grazing regime in the Sterling Wildlife Management Area (SWMA), designed to reinvigorate vegetation communities and promote ecosystem productivity, diversity and sportsman accessibility – but need data to auantify the efficacy of the project to inform future action.

Partners:

Idaho Department of Fish and Game

Earth Observations:

- Landsat 5 TM
- Landsat 8 OLI
- Landsat 9 OLI-2

- Sumoi NPP VIIRS
- Aqua/Terra MODIS

Impact: Project outcomes are aimed at enhancing the decision-making capacity of our partners through assessments of previous management actions' efficacy in

creating desired vegetation community structures and by forecasting future effects. This data will aid in the process of facilitating the creation of landscape ecological mosaics, ecological diversity, and enhancements in the land use of a diverse array of stakeholders.





Pocatello

Idaho

Coronado Ecological Conservation

Community Concern: Coronado National Memorial has experienced habitat destruction and invasive species spread due to the US-Mexico border wall construction and the expansion of social trails. The disturbance threatens the resilience of native species in southern Arizona.



Partners:

• National Park Service

Earth Observations:

- Landsat 9 OLI-2
- Landsat 8 OLI
- Landsat 7 ETM+
- Landsat 5 TM
- Sentinel-2 MSI
- PlanetScope
- RapidEye

Impact: Vegetation classes and health maps will highlight invasive species spread in areas with high disturbance. These end products will assist the National Park Service in its management practices by prioritizing sites for restoration and mitigation.



New Hampshire Ecological Conservation

Community Concern: Loons (*Gavia immer*) are an important bio-indicator species, but populations in New Hampshire are threatened by human impact—lead fishing tackles, shoreline development, and boat collisions—as well as environmental stressors. Since 1982, there has been substantial variability in reproductive success to maintain healthy loon populations.



Earth Observations:

- Landsat 9 OLI-2
- Landsat 8 OLI
- Landsat 7 ETM+
- Landsat 5 TM
- GPM IMERG

Partners:

Loon Preservation Committee (LPC)

Impact: TerrSet Land Change Modeler will be used to simulate future urban development and the results will be cross-referenced with decades of loon presence/absence data from the LPC. Identifying habitats likely threatened by future development will inform targeted and preemptive preservation efforts in the future.



Southeast US Agriculture

Community Concern: Flash droughts cause extensive damage to agricultural systems. In the Southeast, flash droughts are exacerbated by the presence of consumptive vegetation and poor water-holding soils, which severely impacts agriculture during water sensitive growing stages.

Partners:

- Alabama Office of the State Climatologist
- NOAA National Integrated Drought Information System
- National Coordinate Soil Moisture Monitoring Network

Earth Observations:

- Landsat 9 OLI-2
- Landsat 8 OLI
- Landsat 7 ETM+
- Landsat 5 TM
- Landsat 4 TM
- Next Generation Weather Radar Stage IV

Impact: Various climatology and flash drought analyses will identify areas that are historically vulnerable to flash droughts, and partners can pair them with circular crop calendars to visualize the impact of flash drought on different growing stages of crops.



Image credit: Maud Correa, Unsplash



Southern Rockies Western Slope Agriculture

Community Concern: Ranchers on the Western Slope face large uncertainty about the amount of rangeland production/forage that will be available for their livestock each year. This uncertainty makes it difficult to make adaptive management decisions, such as how many livestock to keep in a drought year.

Partners:

- University of Nebraska, National Drought Mitigation Center
- Bureau of Land Management, Colorado River Valley Field Office
- USDA, US Forest Service
- Colorado State University Extension

Impact: End products will support drought planning across the western slope of the southern Rocky Mountains by providing data-driven recommendations for ranchers for improved adaptive management.

Earth Observations:

- Landsat 5 TM
- Landsat 7 ETM+
- Landsat 8 OLI
- Landsat 9 OLI-2

